IMMEDIATE SUTURE OF THE GALL-DUCTS AND THE GALL-BLADDER AFTER EXTRACTION OF STONES, WITH CASES.

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THIS article is written in the belief that the operations of cholecystotomy and cholecystenterostomy have become too much the routine practice in the relief of gall-stones. The author holds that incision of the ducts or the gall-bladder followed by immediate suture is the proper operation in the majority of cases, and especially in recent cases.

Having formed this opinion a little more than a year ago, it is interesting to note that I have been able to do this operation in every case but one which has come under my care since that time. I have had five such operations: one on the hepatic duct, one on the common duct, and three on the gall-bladder. All have been successful.

CASE I.—*Removal of an Impacted Stone from the Hepatic Duct, with Immediate Closure of the Duct.* The patient, aged fifty-nine years, was a powerful man of good habits. He had been jaundiced thirty-five years before. His present illness began in March, 1894, when he became jaundiced and suffered severe pain in the umbilical region. He was confined to his bed for four months, suffering from attacks of intense pain which recurred every two or three weeks and lasted from two to three days. Each attack of pain was followed by a more intense yellow color of the skin, which cleared up between the attacks. He vomited frequently, and the stools remained clay-colored. He had steadily lost flesh for five months.

On August 27, 1894, he entered my wards at the Massachusetts

Hospital by the advice of his physician, Dr. Breck. On examination nothing could be felt in the region of the gall-bladder, except a vague sense of resistance. The urine contained a slight trace of albumen and hyaline, fine and coarse granular casts. While at the hospital he had one of these acute attacks in which his temperature rose to 104° F.

Operation.—On September 4 I opened the abdomen by an incision in the upper right linea semilunaris. The gall-bladder was found empty and flaccid, the ducts were palpated, and a stone was felt deep under the liver in the hepatic duct. The stone could not be pushed along the duct nor crushed with the fingers. No other stone was felt in the common or cystic duct. After separating numerous adhesions, the stone was seized between the thumb and forefinger of the left hand and pulled up from its deep position. Adhesions and duodenum were pushed aside until the stone appeared between the fingers with only the peritoneum and the wall of the duct covering it. The field of operation was packed with gauze to prevent contamination with bile, the duct was incised, and a stone the size of a robin's egg extracted. The duct was closed at once with catgut sutures, a second row of silk sutures including the peritoneum being placed outside. The duct was held with the fingers, and very little bile escaped. A drainage-tube and gauze was packed down to the sutured duct. A rapid and complete recovery followed. The duct did not leak, and on the second day the gauze drain was removed. On the fourth day the abdominal wound was completely closed by provisional sutures. The jaundice had partially disappeared, and the stools were natural in color. The patient was well in three weeks. Eight months after operation he was known to be in perfect health.

CASE II.—*Removal of an Impacted Stone from the Common Duct, with Suture of the Duct.*—This case has already been reported,[1] and will, therefore, not be given in detail. The patient had suffered from gall-stone colic, and cholangitis for ten years. She came to the hospital, with temperature 102° F. and pulse 110, in a state of extreme exhaustion and suffering. The gall-bladder was so large (size of child's head) that it was not recognized as such. I did an exploratory operation, and on finding the greatly distended and much thickened gall-bladder, I did a cholecystotomy for the relief of acute symptoms. The ducts were not explored on account of the patient's feeble condition. The acute symptoms were relieved, but the symptoms of

[1] Boston Medical and Surgical Journal, July 26, 1894.

cholangitis continued, and the stools continued clay-colored, all the bile escaping through the fistula. Four months after the first operation I reopened the abdomen and palpated the ducts until I found a large stone impacted in the common duct near the duodenum. I incised the duct and removed one large and several small stones and closed the duct with silk sutures. The patient made a good recovery, but when last seen the fistula of the gall-bladder was still open.

CASE III.—*Stones Removed from the Cystic Duct, with Immediate Suture of Gall-Bladder Incision.*—The patient, a woman of forty years, with chronic phthisis, awoke one night with severe abdominal pain and tenderness. She then discovered a bunch just above and to the right of the umbilicus. After two weeks illness' in bed the pain and tenderness passed off, but returned after vomiting on board ship. Since then the pain and tenderness had disappeared and returned at intervals. It had troubled her particularly while sitting at her work. (She is a seamstress.) The tumor had slowly increased in size. She had never been jaundiced, nor had the stools been clay-colored. She was pale, badly nourished, with a constant cough. To the right and slightly above the umbilicus there was a small rounded tumor, which was movable but attached to the liver, and was easily recognized as the gall-bladder. The urine contained slight trace of albumen with fine granular and hyaline casts with renal cells. On July 11, 1894, the abdomen was opened over the tumor, which proved to be the gall-bladder, about the size of an orange. On opening it two stones the size of a walnut were squeezed up from the cystic duct by external manipulation. The gall-bladder contained only mucus. The walls were much thickened (one-eighth of an inch) and intensely red, with gray, degenerate-looking patches on the mucous membrane. The ducts were palpated and sounded, but no more stones were found. The gall-bladder was closed by a continuous catgut suture in the muscular coat, and interrupted fine silk sutures in the peritoneal coat. The abdomen was closed with a small gauze drain leading to the wound in the gall-bladder.

The patient complained of colicky pain for a day or two, but made a prompt recovery, the wound healing by first intention.

The patient was seen eight months after the operation. The tuberculosis had advanced, and she was in very poor health. The liver was small, and the fæcal discharges had been gray in color for a time, but had become normal. There was no trouble in the gall-bladder region.

CASE IV.—*Immediate Suture of the Gall-Bladder after Extraction of Stones.*—The patient was a woman, aged thirty-seven years. Since childhood had had attacks of bilious colic. During the last six months had had attacks every three or four weeks, and in the last month five attacks. The pain was exceedingly severe, often causing the patient to faint. For the last two years she had taken chloroform for the pain. She was always tender in the gall-bladder region, and during an attack there was exquisite sensitiveness there. Fæces had only once been noticed as clay-colored. Jaundice was sometimes present during the attacks, but disappeared between times. The face had become dark and pigmented in the last three years. She had lost seventy-four pounds in weight, and had an expression of suffering. Nothing abnormal could be felt in the gall-bladder region. At the operation the gall-bladder was not thickened nor distended, but contained several large stones, and one was removed from the cystic duct, being pushed up with ease. The other ducts were clear. The gall-bladder was closed with two rows of stitches. A small gauze drain was left in the abdominal wound, which was removed on the fourth day. The wound healed by first intention, and the patient was discharged in less than a month.

The fifth case was an exploratory operation, in which the gall-bladder was opened and the ducts sounded and palpated, but no stone could be found.

The gall-bladder was closed by a double row of sutures and dropped without drainage. The wound healed quickly, but the patient still suffers from some obscure liver trouble.

Stones in the Gall-Bladder or Cystic Duct.—A few years ago, when the subject was new, Tait's success seemed wonderful, and cholecystotomy was considered satisfactory, but as our experience has accumulated we find that immediate suture of the gall-bladder is quite as safe in proper cases, and is much more satisfactory. Heussner, according to Voight,[1] has done this operation thirteen times with good results. Korte[2] reports five cases, all of which recovered. Successful cases are also reported by Abbe, Richardson, and many others. Bad results from a leakage of bile have rarely been reported in late years. In fact, there

[1] Deutsche medicinische Wochenschrift, 1894, No. 34.

[2] Sam. klinische Vorträge, 1892, No. 46.

seems to be very little danger from this accident in cases where the common duct is clear and the walls of the gall-bladder are in a moderately healthy condition, and only such cases are suitable for immediate suture.

Cholecystectomy was brought forward by Langenbuch as a radical cure for the formation of gall-stones, in that the stones were supposed to be formed in the gall-bladder. It has, however, been clearly shown that the nuclei of stones are formed in the liver. Cholecystectomy is, therefore, not a radical cure for stone-formation, and should only be practised in cases of malignant disease or of very severe inflammation of the gall-bladder or where the cystic duct is permanently closed.

Stones in the cystic duct have usually been removed by forceps through the gall-bladder, but there is always danger of pushing the stone into the common duct, which must be regarded as a serious accident. This happened to Kehr, and there are cases on record where the stone was pushed into the hepatic duct and never recovered (Bland Sutton, Richardson.) I have found that pushing the stones up by squeezing the duct with the hand is much more effective than fishing through the gall-bladder with forceps.

Incision of the duct is preferable to prolonged manipulation with hands or forceps.

Kehr[1] reports seven cases where he removed an impacted stone from the cystic duct by an incision of the duct, which was closed with sutures. In each of his cases he did a cholecystotomy for drainage of the duct, as well as to prevent back pressure of bile from straining the sutured duct.

Stones in the Hepatic or Common Ducts.—The problem here is to clear the ducts with as little damage as possible, so that they may resume their functions. When the stone is small and soft, it can sometimes be crushed between the thumb and forefinger or be pushed into the duodenum or back into the gall-bladder. Such a condition is most fortunate. Breaking up a stone with a needle or with padded forceps has been done with

[1] Archiv für klinische Chirurgie, Vol. XLVIII, 1894, p. 619.

success in many cases by Tait, Thornton, Mayo Robson, and others, but it seems to me to be a method by which the duct might be seriously injured without the knowledge of the operator, whereas a linear incision followed by suture leaves the duct clear and sound. Nevertheless, needling or crushing a stone is the proper operation where the duct cannot be raised enough to place sutures.

Cabot successfully incised the hepatic duct for an impacted stone. The opening in the duct was not sutured but drained. My own case, No. I, is the only instance known to me of incision and suture of the hepatic duct.

There are on record a number of cases in which stones have been cut out of the common duct. In several of these the duct has been drained (Richardson, Cabot, and others). In a few the opening has been simply tamponned with gauze (Hochenegg and Bland Sutton). Abbe and Gordon Lloyd partly closed the duct with sutures and drained it. McBurney successfully removed a calculus from the end of the common duct through an incision in the duodenum with subsequent suture. The results in these cases have been by no means discouraging. But immediate closure of the duct by sutures when possible is, of course, the most perfect surgical procedure in these cases. I propose, therefore, to give a *résumé* of the published cases, and to discuss the subject in detail. Terrier,[1] in an excellent article on choledochotomy, has already collected a number of cases, which I include:

(1) *Kummell* (*Deutsche medicinische Wochenschrift*, 1890, No. 12, p. 237).—Cholecystectomy having been finished for stones in the bladder, a stone was found in the common duct and at once removed by incision. Suture of dilated duct. Death in twenty hours from collapse.

(2) *Thornton* (*Lancet*, 1891, April 4) reports three cases. In the first he closed the common duct after the extraction of stones. Sutures not tight, hence a drain was placed down to the duct and another in Douglas's fossa. Recovery rapid. Was known to be well two years later.

[1] Revue de Chirurgie, Nov. 10, 1892.

(3) *Thornton.*—Cholecystotomy for stones in the bladder followed by incision of the common duct, which was closed by sutures. Gall-bladder sutured to the abdominal wound; drainage. Recovery without a fistula. Up in nineteen days.

(4) *Thornton.*—Suture of common duct with a double row of sutures with drainage of space below the liver. The patient left the hospital in three weeks. Five months later well but slightly jaundiced.

(5) *Heussner* (*Deutsche medicinische Wochenschrift,* 1890, No. 34).—The gall-bladder was opened and five stones removed. This was closed with sutures. A stone was then found in the common duct near the duodenum. This was removed by incision of duct, which he sutured, but was unable to prevent bile from oozing between the stitches. Drainage. The patient recovered and left the hospital in three weeks.

(6) *Courvoisier* (*Chirurgie den Gallenwege,* Leipsic, 1889) had previously tried to crush the stone in the common duct and had abandoned the operation on account of the poor condition of the patient. At a second operation the stone was removed by incision. The duct was closed with sutures; gauze drain. Rapid recovery.

(7) *Courvoisier.*—Two operations, cholecystotomy first, later extraction of stone from the common duct followed by sutures which did not prevent leaking of bile, hence drainage. Bile flowed from the abdominal wound. Recovery.

(8) *Courvoisier.*—Cholecystotomy with removal of stones; the fistula remained open and the patient was not relieved.

At a second operation a large stone was removed from the common duct which was closed by sutures. Then a cholecystenterostomy was done and the bile fistula was closed. Recovery.

(9) *Küster* (*Verhandlungen der deutschen Gesellschaft für Chirurgie,* Twentieth Congress, April, 1891).—Two stones removed from the dilated common duct, which was closed by sutures (double row). Gauze drainage.

Eleven days after operation hæmorrhage from the drainage tract, which necessitated cauterization with thermo-cautery and tamponning with gauze. Recovery. A year later the patient passed two stones.

(10) *Rehn* (*Verhandlungen der deutschen Gesellschaft für Chirurgie,* April, 1891).—Cholecystectomy, followed by removal of five stones from the common duct, which was closed by sutures and the abdomen was closed without drainage. Recovery.

(11) *Braun* (*Verhandlungen der deutschen Gesellschaft für Chirurgie*, 1891).—Stone removed from the common duct, which was closed by sutures. Bile escaped into peritoneal cavity. Gauze drainage. Rapid recovery.

(12) *Rudolf Frank* (*Wiener klinische Wochenschrift*, 1891, p. 960).—After an unsuccessful attempt to crush or push a calculus into the duodenum it was extracted by incision of the duct, which was sutured. Drainage; recovery.

(13) *Küster* (*Verhandlungen der deutschen Gesellschaft für Chirurgie*, 1891).—The patient had an old bile fistula. A large stone was extracted from the common duct, which was closed with sutures; at the same time the fistulous opening in the gall-bladder was closed. Both wounds were tamponned with iodoform gauze.

Recovery was slow on account of long-continued suppuration of the fistulous tract.

(14) *F. Terrier* (*Revue de Chirurgie*, Paris, November 10, 1892).—Patient with cirrhosis of liver. Stones removed from the very end of the common duct in the head of the pancreas, opening in duct closed with sutures. Drainage; death on second day.

(15) *Marcy* (*Journal of American Medical Association*, December 20, 1890).—The distended gall-bladder was opened and a stone removed, but another in the common duct could not be dislodged. The duct was opened and the stone was then removed with difficulty; the opening in the bladder and the duct was sutured by three rows of stitches; the entire wound of the viscus measuring four inches. Abdomen closed without drainage. Rapid recovery.

(16) *Mixter* (*Boston Medical and Surgical Journal*, July 26, 1894).—Six stones were removed by cholecystotomy; the fistula remained open; three months later the common duct was incised and a large stone removed. The duct was sutured. Prompt recovery.

(17) *Murphy* (*New York Medical Record*, January 13, 1894).—Excision of stone from a one-inch incision in common duct, which was closed by a continuous suture. Death on the second day. No autopsy.

(18) *Ross* (*Canadian Practitioner*, April, 1894).—Several stones were lodged in the common duct. The duodenum was accidentally torn open; this opening was enlarged in the hope of reaching the stone through the end of the duct, but the opening of the duct could not be found. The common duct was then incised and the stones removed. The duct was sutured, but owing to its friability at the

part lately occupied by the roughened stone, it was impossible to prevent the leakage of bile. Iodoform packing and drainage. The bile continued to flow, but suddenly increased after vomiting, and the patient died fifty-six hours after the operation.

(19) *Mayo Robson* (*British Medical Journal*, April 28, 1894).—Case 52 in table. Large stone removed from common duct through an incision which was sutured. Drainage. Death from fæcal extravasation through a small hole in the colon, caused by separating adhesions and unrecognized at the time of operation.

(20) *Kehr* (*Archiv für klinische Chirurgie*, Vol. XLVIII, p. 619, 1894).—Cholecystotomy for empyema of gall-bladder. Several months later a stone could be felt with a sound in the cystic duct. In attempting to extract this with forceps the stone was pushed into the common duct. Ten months after the first operation the stone was removed by choledochotomy. The fistula healed in three weeks.

Including my own cases there are twenty-two cases with five deaths, and including Kehr's cases of suture of the cystic duct there are twenty-eight cases, making a mortality of less than 18 per cent. In considering this mortality, we must remember that the cases include the most unfavorable forms of cholelithiasis, and that the stones were removed from various parts of the ducts, and some of them under the most unfavorable conditions as regards peritoneal adhesions and secondary disease of the liver, also that they were done by fifteen different operators.

Of the five deaths one was due to shock, one to cirrhosis of the liver, one to an accidental injury of the intestine, and only one to leakage of bile.

In five of the cases, bile leaked through the stitches, but only one of these died. Drainage, usually gauze, was used in every case except three. Küster, Rehn, and Marcy closed the abdomen without drainage with recoveries, but Küster had leakage of bile from the abdominal wound. In seven cases the gall-bladder was left open, six times by a cholecystotomy and once by a cholecystenterostomy; all recovered. Heussner, Courvoisier, and Marcy having opened the gall-bladder as well as the duct, closed both at the same operation with good results. Küster closed a fistula and Kummell did a cholecystectomy, at the same

time suturing the common duct. Courvoisier having sutured the duct, closed an old fistula and then did a cholecystenterostomy at one sitting, which seems a most unnecessary complication of operations, as the fistula would probably have closed after the stone was removed from the common duct.

Convalescence was short in the majority of these cases; four left the hospital in about three weeks, others are reported as recovering " rapidly."

As before stated, it is essential in every case that an outlet should be provided for the bile. If, therefore, the gall-bladder is to be sutured we must make sure that the common duct is open. If the hepatic, cystic, or common ducts are to be sutured, we must make sure that the ducts are clear below the point of suture; if they cannot be cleared, we must provide an outlet for the bile in the other direction, either by a cholecystotomy or by a cholecystenterostomy.

In certain cases the condition of the patient will not admit of a complete operation at one sitting; in such cases cholecystotomy may be done for the relief of cholæmia, and the stones may be removed from the common duct by a later operation.

It is in this class of cases that cholecystenterostomy has, it seems to me, been done altogether too frequently of late. The very important invention of Murphy's button has so greatly reduced the mortality of this operation that the main object—that of restoring the ducts to their normal condition—seems often to have been lost sight of in the zeal for an immediate success. Murphy reports seventeen cases done by himself and others without a death; but less favorable reports have followed. In many of these cases no attempt was made to remove the stones from the gall-bladder, and the ducts were not even examined, yet these cases are reported as well. In my opinion no case is well as long as stones remain in the duct. Stones in the duct, even when the bile pressure is removed, continue to cause cholangitis and chronic peritonitis much as a diseased appendix or Fallopian tube does. They are foci of inflammation, and cause processes of ulceration. To be sure, some of the stones loosen and come out, but, on the other hand, they are often impacted and held by

a cicatricial stricture (Abbe). If the stones loosen and come away, leaving the ducts clear, it is much better that the patient should not be left with the gall-bladder opening into the intestines. That there is a real danger of the bacteria of the intestine penetrating the biliary fistula and infecting the liver is shown by a case reported by Ricard[1] in which death occurred fifty-three days after the operation of cholecystenterostomy, although the patient did well at first. Death was found due to infection of the bile passages from the intestinal canal, numerous abscesses of an ascending infection being present.

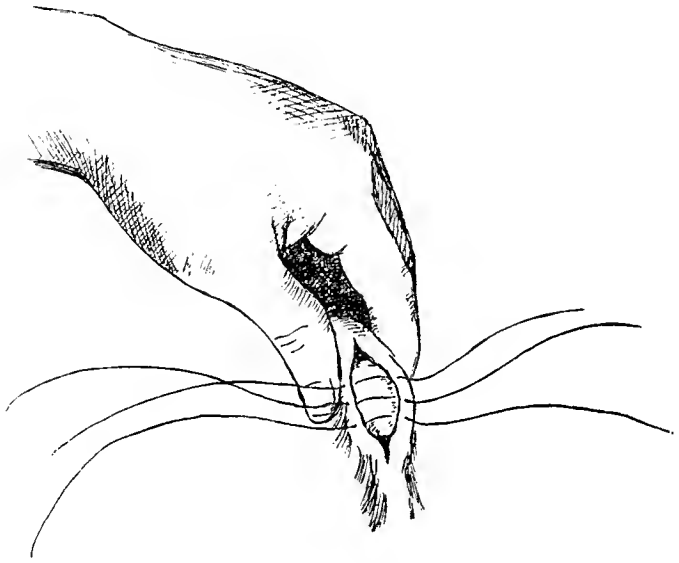
I think, therefore, that cholecystenterostomy should be limited to cases in which there is an irremediable stenosis of the common duct.

The question of doing a cholecystotomy in connection with the suture of the ducts is one of great importance. Kehr thinks it should always be done, as a duct which has been obstructed ought always to be drained for a time. On the other hand, we have seen that many cases have done admirably without opening and draining the gall-bladder. It seems to me certain, however, that in all the cases where the duct has been incised and cannot be sewed or is imperfectly sewed, or where the stitches cut out on account of the friable condition of the duct, a cholecystotomy ought to be done to prevent the distention of the duct. Cholecystotomy ought always to be done where the pathological condition of the bile-passages requires drainage, as in empyema of the gall-bladder and suppurating cholangitis. Nevertheless, I believe that the ordinary conditions due to obstruction recover without drainage soon after the obstruction is removed, as may be seen from the cases reported in this paper.

Technique.—The objection to immediate suture of the ducts is the difficulty of the operation and its supposed dangers. Thornton speaks of the great difficulties of sewing the common duct, and used a Ferguson speculum to expose the duct in its deep position. Cabot used a hooked knife to incise the duct by touch. A, I have found the operation less difficult than I ex-

[1] Bul. Soc. Chirurgie, xx, p. 572, 1894.

pected, I will give the method by which I sutured the hepatic and common duct. The patient is hung by straps under the arms on an inclined plane at an angle of something less than forty-five degrees. A sand-bag is placed under the back, so that the patient is bent over it. In this position the intestines gravitate to the lower part of the abdomen, so that when the liver is held up by a retractor the air sucks in between the liver and intestines much as it enters the pelvis in the Trendelenburg



The duct is held by thumb and finger of left hand. The stitches are placed before the stone is removed.

position. The abdomen is opened in the right linea semilunaris. The gall-bladder is seized and pulled up, and the course of the ducts is palpated with great care. When a stone is found, the rest of the ducts should be palpated with especial care, as the success of the suture depends on the unobstructed flow of the bile. When a stone is found, it is grasped with the thumb and finger of the left hand and raised to as convenient a level as possible. The fingers should not be removed from the duct

until the stitches are tied. The duct is incised over the stone by a longitudinal cut. The stitches are then placed in the sides of the duct before the stone is removed (see Fig.); for the instant the stone is removed the duct collapses and the wound is bathed in bile and cannot be brought into an accessible position again. As the stone is removed the fingers may squeeze the duct above to prevent the flow of bile before the stitches are tightened; at this point a sound can easily be passed down the duct if desired. Two rows of stitches are placed, catgut being used for the duct itself and silk for the overlying peritoneum. A small drainage-tube is passed down to the duct and surrounded with gauze. The abdominal wound is closed except at the point where the gauze is to be removed.

Conclusions.

(1) Every operation should be conducted with the idea of restoring the functions of the ducts, and that any irreparable injury to them is a serious calamity.

(2) Immediate closure of the gall-bladder is safe if the ducts are clear and its walls healthy.

(3) Incision and suture of the cystic duct is preferable to prolonged manipulation.

(4) Incision and suture of the hepatic and common ducts is the operation of choice for impacted stones.

(5) The mortality of this operation is less than 18 per cent.

(6) If the condition of the patient is critical, a preliminary cholecystotomy is advisable.

(7) Cholecystenterostomy should be reserved for irremediable stenosis of the common duct.